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### (54) Hand-actuated tooth brush

(57) Actuated toothbrush including a head (1) which is movable with respect to the handle (3) of said toothbrush, and one or more groups (2 202, 203, 204) of bristles connected to elements (8, 102, 103, 20) of the head (1), said elements being provided with a translating, sussultory, oscillating, rotating or any other kind of motion; the motion of said elements (8, 102, 103, 20)

with respect to the head (1) or to a part of it (101, 104) is determined by the reciprocation of the handle (3) of said toothbrush during the tooth-brushing operation, said reciprocation being transmitted to said elements (8, 102, 103, 20) thanks to suitable connecting means (4, 5, 6, 14, 15) between said elements and said handle (3).

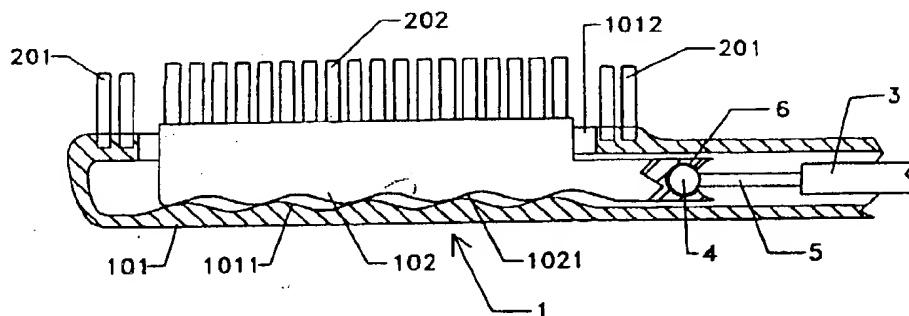


Fig. 3

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## Description

[0001] The present invention refers to toothbrushes and in particular to an actuated toothbrush, that is to say, which can provide for a series of additional movements of its bristles besides those normally resulting from the alternating movement of the user's hand while brushing his/her teeth, so as to simplify and increase the abrasive and cleaning action of said bristles onto the dental surface during the brushing operation.

[0002] From the present state of technology it is known how to carry out toothbrushes provided with bristles similar to dental profiles or electric toothbrushes with mechanised bristles. In the first case, said toothbrushes are not very efficient since their cleaning action on the teeth is not satisfactory, as the only motion which is transmitted to the bristles is given by the alternating movement of the user's hand while brushing his/her teeth, said heads supporting said bristles being stiffly fixed or integrally made with the handle, whereas electric toothbrushes provided with mechanised bristles are often of little convenience and rather expensive.

[0003] The present invention aims at overcoming said known disadvantages and imperfections concerning toothbrushes by means of an actuated toothbrush, equipped with one or more groups of bristles which can be moved with a translating, sussultory, oscillating, rotating or any other kind of motion given by the movement of movable elements on the toothbrush head where said groups are fixed, the motion of said movable elements resulting from the alternating motion of the toothbrush handle while brushing one's teeth by means of suitable connecting means between said movable elements and the handle.

[0004] Therefore, the toothbrush according to the present invention advantageously changes the alternating movement of the user's hand while brushing his/her teeth into an additional alternating, rotating, oscillating, sussultory or any other kind of motion of the bristles supported by movable elements which are mounted in the toothbrush head, which cannot but help the cleaning action on the teeth during the brushing operation.

[0005] The present invention will be better understood thanks to the following description of the enclosed drawings, which should be considered as a mere non-limiting example, in which:

Fig. 1 shows a perspective view of a first form of embodiment of the toothbrush according to the present invention;

Fig. 2 shows a plan view, partly sectioned, of the toothbrush according to Fig. 1;

Fig. 3 shows a sectioned side view of a second form of embodiment of the toothbrush according to the present invention;

Fig. 4 shows a sectioned side view of a third form of embodiment of the toothbrush according to the present invention;

Fig. 5 shows a plan view, partly sectioned, of a fourth form of embodiment of the toothbrush according to the present invention; and

Fig. 6 shows a side view, partly sectioned, taken on the line VI-VI in Fig. 5, of the previous form of embodiment.

[0006] Referring to Fig. 1 and Fig. 2 the toothbrush according to a first form of embodiment of the present invention consists of a head 1, made for instance of plastic material, housing one or more discs 8 (in this case three), which are fixed by means of pins 10 onto the bottom of said head 1, said discs 8 being placed, with their axes of symmetry passing through the pins 10, along the longitudinal axis of the toothbrush and being reciprocally connected by means of one or more teeth 12 (in this case one) which enter one or more corresponding cavities 13 (in this case one). One of said discs 8, advantageously for instance the first one towards the toothbrush handle 3, is connected by means of a pin 801, placed near the outer portion of said disc, to an arm 9, which is in its turn connected with a snap engagement to the toothbrush handle 3 by means of the introduction of a small ball 4, integrally made with a stem 5 connected to said handle, into a round seat 6, suitably sized to house the ball 4 mortising it, without allowing it to get out of said seat during the normal alternating movement of tooth-brushing. The toothbrush head 1 is also equipped with one or more openings 7 (three for instance) making it easier to wash the toothbrush after its use.

[0007] The three groups 2 of bristles according to the form of embodiment shown in the Fig. 1 and 2 are actuated with an oscillating motion, since each of them is fixed onto the three discs 8 moved by an oscillating movement thanks to the alternating movement of the toothbrush handle 3. The alternating movement of the user's hand and therefore of the handle 3 during the brushing operation transmits an alternating motion to the arm 9, which, on one end, is fixed with a snap engagement through the previously mentioned coupling means (4, 5, 6) to the handle 3, whereas on the other end, said arm is connected by means of a pin 801 to one of the discs 8, preferably the first one, called hereinafter driving disc. For instance, the introduction movement of the stem 5 into the head 1 will cause a clockwise rotation of the driving disc 8, hinged to the arm 9 around the pin 10 fixing said disc onto the bottom of the head 1, such rotation being at least of 30°. It will be evident observing the figure that, if the disc 8 makes a clockwise rotation, the following disc, connected to it by means of the tooth 12 of the driving disc and its cavity 13, will make the same rotation in the opposite direction, i.e. anti-clockwise. Therefore, as was said before, since all the discs 8 are reciprocally connected by means of the coupling tooth 12-cavity 13, the rotation of the driving disc will be transmitted with the same absolute value until the last disc of the head 1. It is obvious

that by pulling back the handle 3 there will be an anti-clockwise rotation of the leading disc 8 and, consequently, of all the other discs in sequence, in this case two. Therefore, if the rotation is at least of 30°, the total angle of rotation of the discs 8 will be at least of 60°. A group of bristles 2 is fixed onto each of said discs 8, said group rotating integrally with the rotation of the discs, thus taking on an oscillating movement resulting from the alternating movement of the handle 3. Obviously, should there be more than one tooth 12 and therefore one corresponding cavity 13 for each disc 8, it could be possible to give a greater rotation to each of such discs 8 and therefore a greater oscillation to the groups 2 of bristles supported by said discs.

[0008] Fig. 3 shows a second embodiment of the toothbrush according to the present invention. As can be noticed from the figure, the removable head 1 of the toothbrush consists of an outer fixed part 101 and of an inner movable part 102, the latter being coupled to the toothbrush handle 3 by means of a snap engagement including a stem 5 and a small ball 4 entering a suitable seat 6, said seat being obtained integrally in the inner movable part 102 of the head. Said movable central part 102 is provided with one or more groups 202 of movable bristles, whereas the outer fixed part 101 is provided with one or more groups 201 of fixed bristles. Moreover, the lower surface 1021 of the movable part 102 is characterised by an undulated contour corresponding to the undulated contour of the base surface 1011 of the fixed part of the head 1. As for the form of embodiment of Fig. 1 and 2, the motion of the toothbrush bristles is generated by the alternating movement of the handle 3 as follows: when the handle 3 is moved alternately during the toothbrushing operation, the lower surface 1021 of the inner movable part 102, which is integral with the handle 3, is forced to move along a guide consisting of the base surface 1011 of the fixed part 102. It is clear from the figure that the sliding movement of the movable part 101 onto the fixed part 102 results in a sussultory motion of the group 202 of bristles of the movable part with respect to the groups 201 of bristles of the fixed part, such motion allowing said group 202 of movable bristles to rise and sink of at least 1 mm with respect to the group 201 of fixed bristles. Obviously, as shown by the figure, the fixed part 101 is provided with a suitable opening 1012 allowing the movable part 102 to move with a sussultory motion. To obtain the motion of the movable part 101 onto the fixed part 102, and therefore of the group 202 of bristles with respect to the group 201, by means of the undulated contours of the surfaces 1021 and 1011, the stem 5 will be made of an elastic thermopolimeric material, so that the handle 3 moves only with an alternating movement with respect to the longitudinal axis of the toothbrush.

[0009] Fig. 4 shows a third embodiment of the toothbrush according to the present invention, in which it can be observed that the removable head 1 of the toothbrush consists of an inner movable part 103, provided

with one or more groups 203 of bristles, and of an outer fixed part 104, not provided with groups of bristles; said movable part 103 is coupled with said fixed part 104 by means of an elastic ball joint 14 which is introduced with a snap engagement into a suitable round seat 15, made integrally in said fixed part 104 of the head 1. The coupling between the handle 3 and the toothbrush head 1 is achieved, in this particular embodiment, by pressing a cylindrical part 501 of the handle 3 with a reduced section into a suitable hole 601 of the fixed part 104 of the head 1. During the toothbrushing operation the movable part 103 can freely oscillate of 360° with respect to the fixed part 104 thanks to the elastic round joint 14, which is integral with said movable part and introduced into the suitable round seat 15, so that the group 203 of bristles which are integral with said part can follow the dental contour under every circumstance; moreover, the round joint 14, being elastic, reduces the excessive thrusts of the group 203 of bristles onto the gums.

[0010] Fig. 5 is a top view of another form of embodiment of the toothbrush according to the present invention: in this case, the handle 3 is introduced with a snap engagement by means of the ball 4 of the stem 5 into a suitable round seat 6, obtained integrally in a stem 16 reciprocating along the longitudinal axis of the toothbrush onto a groove 17, obtained on the bottom of the removable head 1 of the toothbrush. Such movable stem 16 is provided with a series of pins 18, for instance four of them as in this drawing, which are introduced into corresponding grooves 19, obtained from the lower surface of four bristle stands 20 suitably shaped. One or more groups 204 of bristles are fixed onto such bristle stands, said groups coming out from suitable openings 105 carried out in the toothbrush head 1. As can be noticed from the figure the grooves 19 which must be connected with the pins 18 are obliquely oriented with respect to the longitudinal axis of the toothbrush, since their function is to allow the transverse reciprocating of the bristle stands 20 with respect to the longitudinal axis of the toothbrush when the handle 3 is given an alternating movement along said longitudinal axis of the toothbrush. Such reciprocating motion of the bristle groups will be led by the reciprocal contact between such groups and by the contact between their lateral upper surface 21 and the lateral surface 22 of the openings 105, as can be better observed in Fig. 6. It is possible to notice from Fig. 5 four bristle stands 20, which are shown here in a completely off-line position with respect to the longitudinal axis of the toothbrush, the latter being the limit position in which the stem 5 of the handle 3 is completely introduced into the toothbrush head 1, and the pins 18 are at the end of their own grooves 19. When the toothbrush handle 3 is pulled during the tooth-brushing operation, the pins 18, going back into their own grooves 19 thanks to the sliding movement of the stem 16 in the groove 17, forces the stands 20 into a transverse translation till they have

reached the opposite end of said groove 19; it is evident from the figure that in that case the stem 5 is at the maximum distance from the head 1, that is to say, the bristle stands 20 are in a symmetrical position to the position shown in the figure with respect to the longitudinal axis of the toothbrush. It should be observed that, advantageously, the stands 20, and therefore the groups 204 of bristles, move in pairs in opposite transverse directions, so as to promote an efficient cleaning of the teeth during the brushing operation.

[0011] Fig. 6 shows a side view of the form of embodiment of the present invention shown in Fig. 5, here presented along the section line VI-VI, in which it is possible to observe the particular shape of the bristle stands 20 and of the sliding stem 16, said stem being provided with a round seat 6 for the introduction with a snap engagement of the ball 4 of the stem 5 connected to the handle 3. It should be also noticed that there can be one or more openings 21, so as to promote the cleaning action of the toothbrush during the brushing operation.

[0012] As will have been evident from the previous description, although the forms of embodiment of the present invention can be manifold, the basic idea which will be put into words in the following claims is to provide an ordinary toothbrush with an additional motion of its bristles besides to that of the user's hand while brushing his/her teeth, which can be carried out by means of an alternating, oscillating, sussultory, rotating or any other kind of movement transmitted to said bristles by movable elements of a head.

#### Claims

1. Actuated toothbrush including a head (1) which is movable with respect to the handle (3) of said toothbrush, and one or more groups (2, 202, 203, 204) of bristles connected to elements (8, 102, 103, 20) of the head (1), said elements being provided with a translating, sussultory, oscillating, rotating or any other kind of motion, characterised in that the motion of said elements with respect to said head (1) or to a part of it (101, 104) is controlled by the alternating movement of the handle (3) of said toothbrush during the brushing operation, said alternating movement being transmitted to said elements (8, 102, 103, 20) thanks to suitable connecting means (4, 5, 6, 14, 15) between said elements and said handle (3).
2. Actuated toothbrush according to claim 1, characterised in that said head (1) can be removed and replaced.
3. Actuated toothbrush according to claims 1 and 2, characterised in that it includes one or more openings (7) in said head (1), so that the latter can be easily washed after being used.
4. Actuated toothbrush according to claim 1, characterised in that said movable elements consist of a series of discs (8) provided with one or more groups of bristles and are interconnected by means of at least a tooth (12) and a cavity (13) obtained from them, said discs being fixed by means of pins (10) on the bottom of said head (1) and at least one of which, called driving disc, is rotated by means of the alternating motion of an arm (9) connected thanks to connecting means (4, 5, 6) with the handle (3) and thanks to a pin (801) with the outer portion of said driving disc (8), which determines the rotation of the following disc connected to it and, therefore, of all the remaining discs (8).
5. Actuated toothbrush according to claim 4, characterised in that said connecting means (4, 5, 6) consist of a small ball (4) obtained integrally from a stem (5) connected to the handle (3), said stem being introduced with a snap engagement into a suitable round seat of said arm (9).
6. Actuated toothbrush according to claim 4, characterised in that the rotation in any direction of each disc (8) is at least of 30°.
7. Actuated toothbrush according to claims 1 and 2, characterised in that said removable head (1) consists of an outer fixed part (101), provided with one or more groups (201) of bristles and of an inner movable part (102), provided with one or more groups (202) of bristles, said movable part (102) being connected thanks to connecting means (4, 5, 6) to the toothbrush handle (3), which moves with a reciprocating motion and transmits to said movable part (102) a sussultory motion, obtained by means of the sliding movement of the undulated contour of the lower surface (1021) of the latter onto the corresponding undulated contour of the base surface (1011) of the fixed part (101) of the head (1).
8. Actuated toothbrush according to claim 7, characterised in that said connecting means (4, 5, 6) include a small ball (4) obtained integrally from a stem (5) made of an elastic polymeric material, said small ball snapping into a suitable round seat (6) obtained from that inner movable part (102) of the head.
9. Actuated toothbrush according to claim 7, characterised in that said vertical sussultory motion of the movable part (102) of the head (1) and therefore of said one or more groups (202) of bristles is at least of 1 mm.
10. Actuated toothbrush according to claims 1 and 2, characterised in that said toothbrush head (1) consists of a movable part (103), provided with one or

more groups (203) of bristles and connected by means of an elastic ball joint (14) to a fixed part (104) of said head (1), from which a round seat (15) housing said joint (14) is obtained, said movable part being able to rotate of 360° on said round joint (14) by means of the reciprocating motion of the toothbrush handle (3) connected to said fixed part (104) by means of a press connection (501, 601).

11. Actuated toothbrush according to claims 1 and 2, characterised in that said head (1) includes one or more groups (204) of bristles fixed onto corresponding stands (20), which can move with a transverse reciprocating motion with respect to the longitudinal axis of the toothbrush by means of the reciprocation, along the longitudinal axis of the toothbrush, of a stem (16), suitably shaped, which slides onto a groove (17) obtained on the bottom of the toothbrush head (1) and connected thanks to connecting means (4, 5, 6) to the toothbrush handle (3) which reciprocate during the tooth-brushing operation, said stands (20) being provided with grooves (19), suitably shaped and oriented, in which pins (18) integral with said stem (16) are introduced.
12. Actuated toothbrush according to claim 11, characterised in that said connecting means include a small ball (4), obtained integrally from a stem (5) connected to the handle (3), said ball (4) being introduced with a snap engagement into a suitable round seat (6) obtained from that movable stem (16).

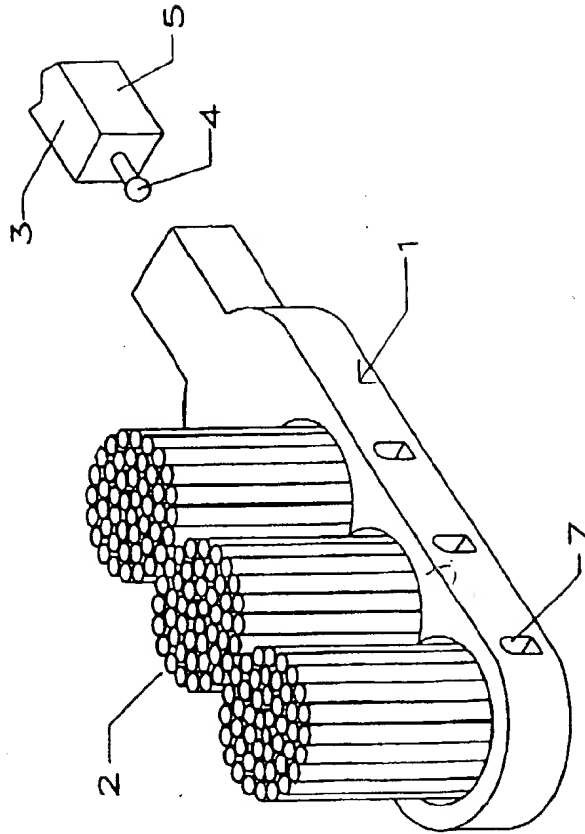


Fig. 1

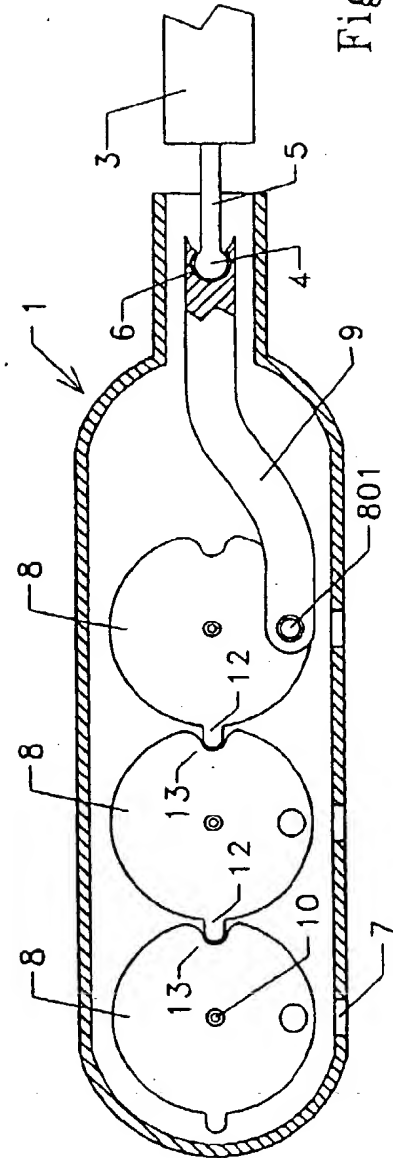
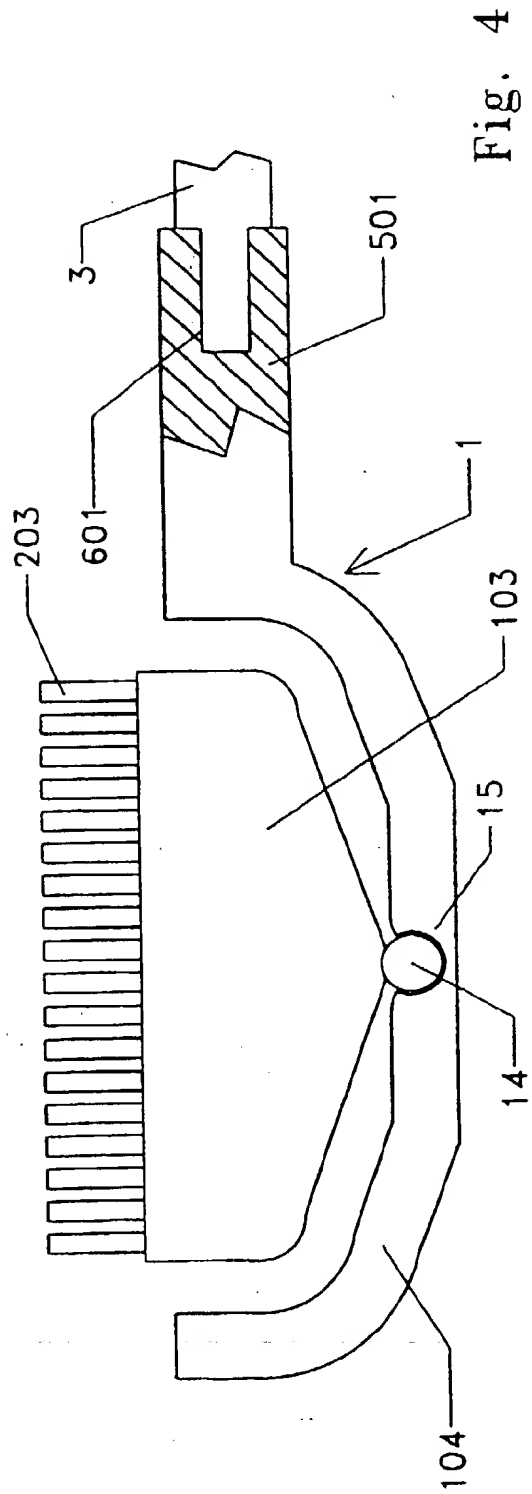
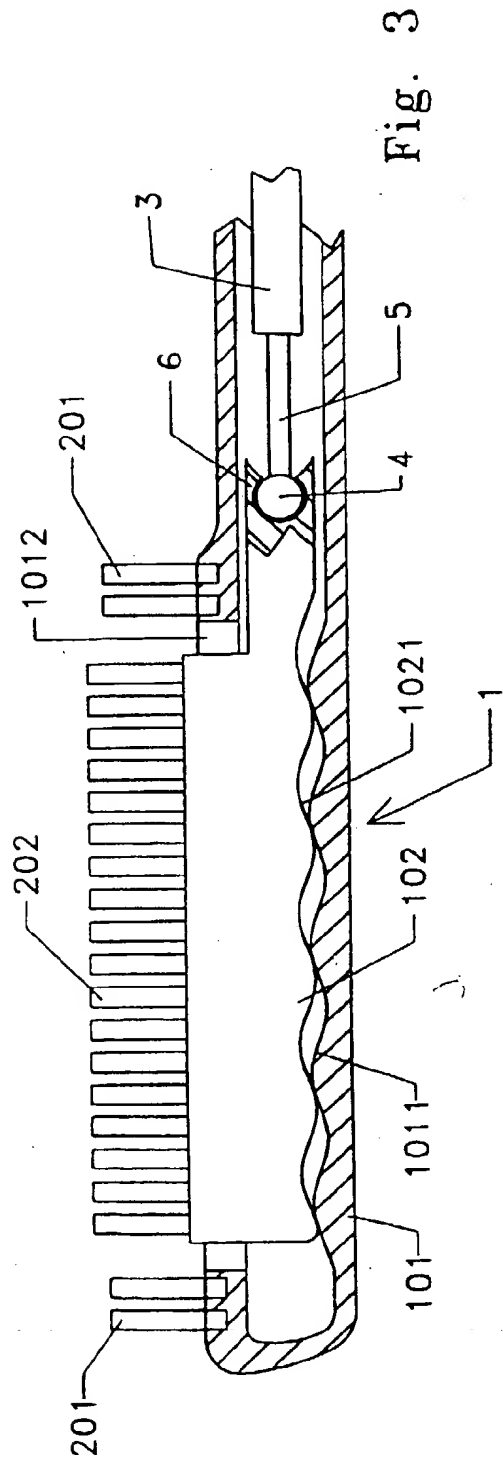


Fig. 2



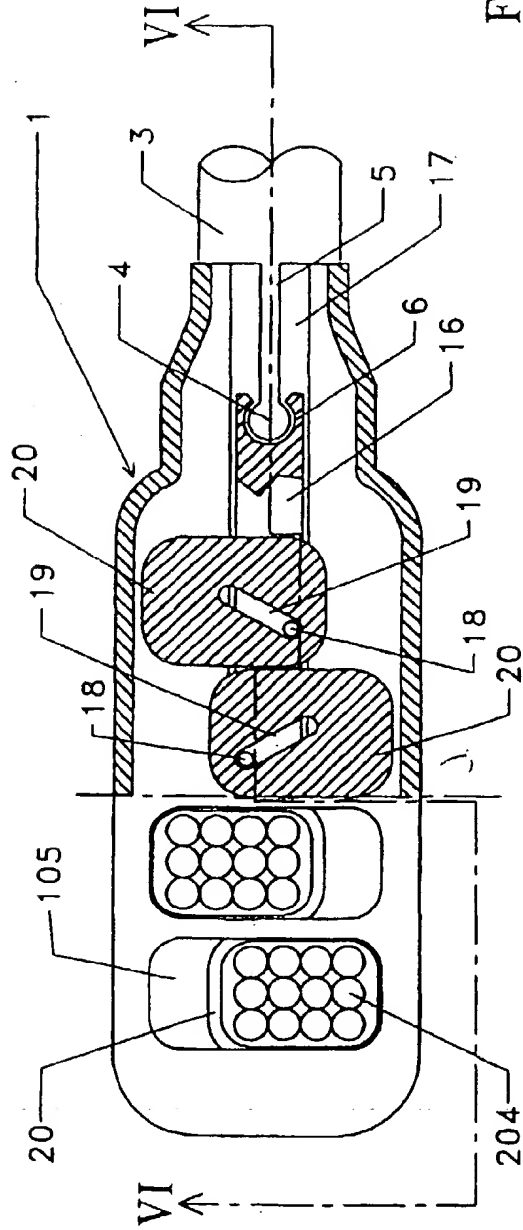


Fig. 5

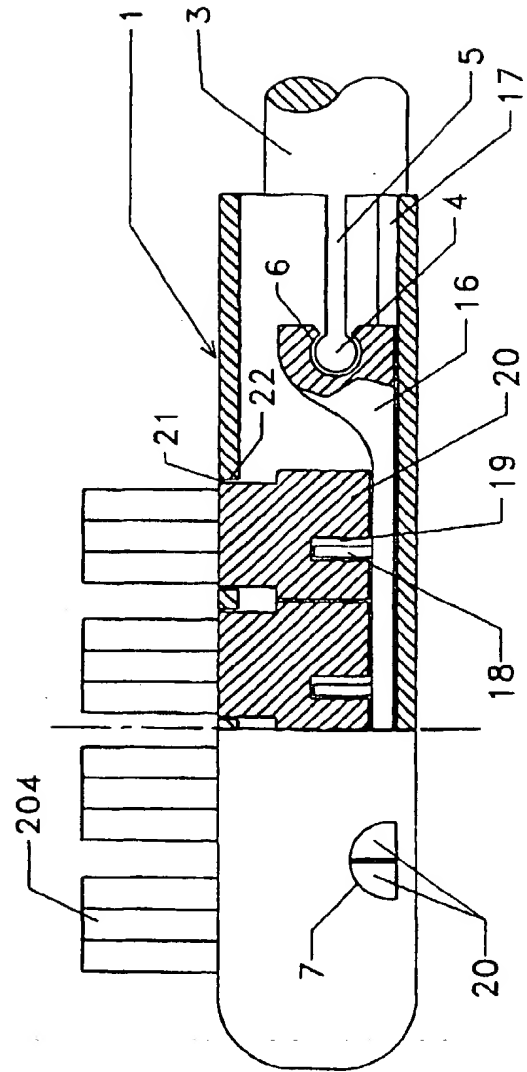


Fig. 6





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Application Number  
EP 99 11 1207

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The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>26 November 1999</b>	Examiner <b>Triantaphillou, P</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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